REFERENCES.

(1) Air masses have been computed from the equation

$$m = \frac{\text{atmospheric refraction (in seconds)}}{58.36'' \times \sin Z}$$

(2) Ball, Frederick. Altitude tables. London, 1907.
(3) Abbot, C. G., and Aldrich, L. B. Smithsonian pyrheliometry revised. Smithsonian Misc. Collection. v. 60, No. 18. Washington, 1913.
(4) See Table 2. Bulletin Mount Weather Observatory. Washington, 1912. v. 5, p. 303–311.
(5) Kimball, Herbert H. The dense haze of June 10–11, 1912. Bull. Mount Weather Obsy., Washington, 1912. v. 5, p. 161–165.

STANDARD UNITS IN AEROLOGY.

The views and practice of some American physicists are probably well presented in the following extracts and articles from Profs. T. W. Richards and A. E. Kennelly, both of Harvard University, and which we now publish with their permission.—EDITOR.

1. [*Extract from* "New method for determining compressibility," by Theodore William Richards and Wilfred Newsome Stull. Carnegie Institution of Washington. Publication No. 7. Washington. December, 1903. p. 42–43.]

"It is a matter of great regret that the scientific world has not agreed upon a less arbitrary unit of pressure than the 'atmosphere.' The difficulty is now increased by the frequent technical use of this word to designate the pressure of a kilogram per square centimeter. The growing tendency toward the adoption of the C. G. S. system suggests the use of a consistent unit for this dimension also. Might not the pressure of a dyne per square centimeter be suitably called a *bar* (Greek βαρος, pressure, weight)? This suggestion is made because the practical use of a unit is always much facilitated by a definite verbal designation. In this case the pressure of a megadyne per square centimeter would be called a *megabar*, a name no more cumbrous than 'atmosphere,' and far more definite. This unit, though unnamed, has long been advocated by Ostwald (Grundriss Allgem. Chem., p. 54, 1899) as a more scientific one than the present standard. The megabar is 1,000 ÷ 980.6 = 101.98 per cent of a kilogram per square centimeter, or 101.98 ÷ 1033.2 = 98.703 per cent of an atmosphere, or the pressure measured by 75.015 centimeters of mercury at 0° C. at sea level, and latitude 45°. This pressure is more nearly the average atmospheric pressure at the laboratories of the world than the arbitrary 'atmosphere' usually taken. A megabar, acting through the volume of a cubic centimeter or milliliter, performs a megerg of work, or one-tenth of a joule."

2. [*Extract from* "The convection of heat from small copper wires." By A. E. Kennelly, C. A. Wright, and J. S. Van Bylevelt, in Proc. Am. instit. electr. eng., June, 1909, v. 28, p. 706.]

"*Air pressure in absolute measure.*—In column II of the foregoing table the air pressure in the tank is recorded in megabars. The C. G. S. unit of pressure, 1 dyne per square centimeter has been called the 'bar'; so that a megabar is 10^6 dynes per square centimeter. According to the recently published data of the Bureau International des Poids et Mesures (Les Recents Progrés de 1907, pp. 30–31), a column of mercury 760 mm. (29.92 inches) high, at sea level, in latitude 45°, exerts a pressure of 1.0132 megabars. Consequently 1 megabar represents the pressure of a column of mercury of 750.09 mm. (29.53 inches) under the same conditions. For most practical purposes, therefore, a megabar may be taken as 1 atmosphere. It is actually 0.987 of an atmosphere of 760 mm. [under apparent gravity] at sea level and 45° latitude."

3. STANDARD UNITS IN AEROLOGY.

By Prof. A. E. KENNELLY.

In "Science" for March 13, 1914 (p. 391), Prof. Alexander McAdie calls attention to the confusion which is likely to be produced in scientific literature by the use of the term "bar" as a unit of pressure, with two distinct significations. I beg the privilege of indorsing in your columns the views there expressed, and of adding a few remarks.

It is generally agreed that the "bar" should be the name of a unit of pressure, in some simple numerical relation of dynes per square centimeter. The question is as to whether it should be applied to the C. G. S. unit (1 dyne per square centimeter) or to a pressure one million times greater. If it is given to the C. G. S. unit, then the standard atmospheric pressure, as hitherto adopted, would be the megabar of 750.09 mm. of mercury. On the other hand, if it is given to this latter standard atmosphere, then the C. G. S. unit of pressure would become equal to a microbar.

It is submitted that in view of (1) the history of the term, (2) of scientific consistency, (3) of existing usage, the "bar" should be adopted as the name of the C. G. S. unit, making the standard atmosphere a megabar.

History.—Prof. McAdie has pointed out that the term "barad" was proposed for the C. G. S. unit by a committee of the British Association in 1888. The International Physical Congress of Paris, in 1900, reported in favor of the "barie" as the name of the C. G. S. unit, (see vol. I of Proceedings, p. 100). The following is quoted from page 31 of Guillaume's "Recents Progres du Systeme Métrique" (Paris, Gauthier-Villars, 1907), a report presented to the Fourth Convention of Weights and Measures in Paris October, 1907:

Cette relation permet de calculer immédiatement la valeur en baries (unite C. G. S. de pression, egale à une dyne par centimetre carré) de la pression exercée par une colonne de mercure de la hauteur normale de 76 cm. dans les conditions de la pesanteur qui résultent de l'ensemble des stations considerées par M. Helmert. On trouve ainsi

P normal=1 013 211 baries.

On peut calculer aussi, en posant P égal a l'unité, la hauteur de mercure qui exerce l'unité de pression. On trouve ainsi 0.75009μ. La megabarie normale serait donc exercée par une colonne de mercure de 750.09 mm., à la témperature de la glace fondante, sous la latitude de 45°, et au niveau de la mer; l'intensité de pesanteur pour laquelle la colonne de mercure, exerçant une pression égale à une megabarie serait de 750.09 mm. devrait avoir la valeur:

g=980.738 cm. sec⁻².

In 1903 Prof. T. W. Richards independently originated and adopted the name "bar" for the C. G. S. unit of pressure in his chemical work.

Scientific consistency.—It is generally admitted that the C. G. S. system is the most generally and internationally recognized physical system of units in use at the present time, and the system most frequently employed in theoretical discussions of physical quantities. The system is strengthened when its unit magnitudes receive internationally recognized names. It necessarily becomes weakened when such names are assigned to unit magnitudes outside the system, even if decimally connected therewith. For example, the C. G. S. system